Small Business Innovation Research/Small Business Tech Transfer

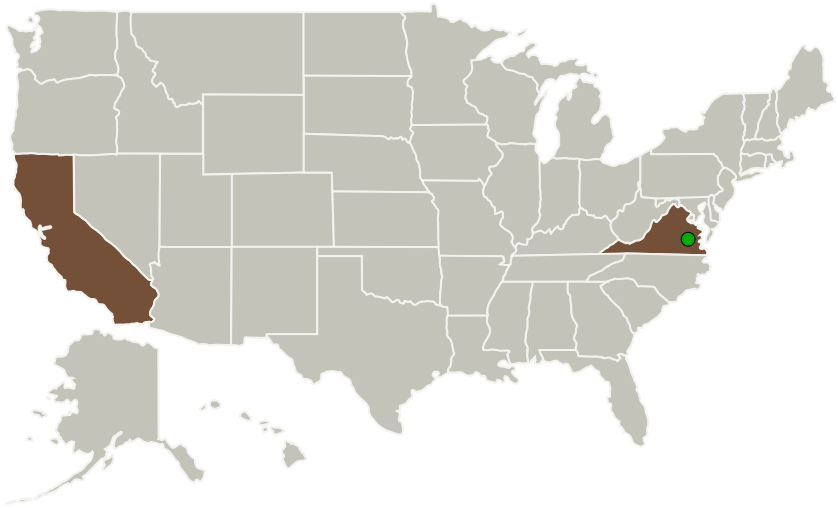
Novel 3D C-SiC Composites for Hot Structures, Phase I

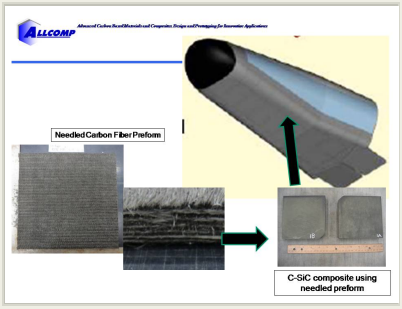
Completed Technology Project (2014 - 2014)

Project Introduction

Future NASA hypersonic vehicles offer a potential to incorporate advanced ceramic matrix composites (CMC). The key characteristics include excellent mechanical properties, excellent thermal shock resistance and ability to survive cyclic oxidation environments. Among the CMC composites carbon fiber-SiC matrix composites offer excellent high temperature capabilities. The highest specific strength C-SiC composites are fabricated via conventional Chemical Vapor Infiltration (CVI) SiC method. There are several limitations to SOTA CVI SiC technology. First, fixturing is required during the processing. Secondly, transverse mechanical properties are quite often design limiting criteria, thirdly manufacturing times are very long and fourth the fabrication of very large parts is limited due to huge capital investments required for very large equipment needed to operate at very low pressure. This proposal addresses all the above stated limitations of classical CVI. First it offers unique 3-D preform capable of increasing transverse properties with minimum degeneration of the in plane properties. Secondly the proposed processing eliminates the need of fixturing. Thirdly, modified CVI SiC significantly reduces processing time. And fourth, Phase II will extend to incorporate extremely novel atmospheric pressure CVI SiC, offering a paradigm shift in CVI SiC by allowing to utilize conventional, low cost atmospheric pressure furnaces routinely used in heat treating applications.

Primary U.S. Work Locations and Key Partners





Novel 3D C-SiC Composites for Hot Structures Project Image

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Organizations Performing Work	Role	Type	Location
Allcomp Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

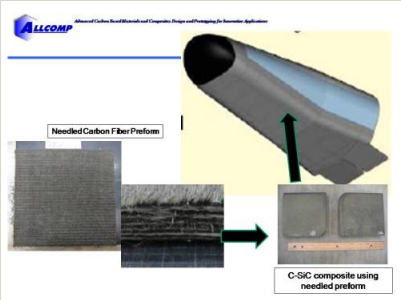
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140553)*

Images



Project Image
Novel 3D C-SiC Composites for Hot Structures Project Image *(https://techport.nasa.gov/image/136384)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Allcomp Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

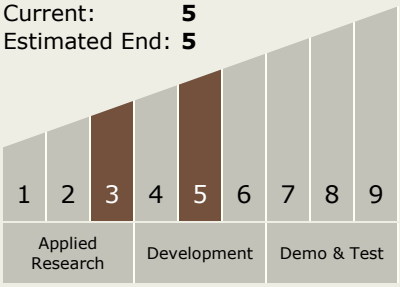
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Steve Jones

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System